

THURSDAY, OCTOBER 23, 1884

## FIELD AND GARDEN CROPS

*Diseases of Field and Garden Crops.* By Worthington G. Smith, F.L.S. (London: Macmillan and Co., 1884.)

THE fact that a handbook of the diseases of crops has been written would not seem to other than botanists and agriculturists to be anything specially noteworthy. But in the British Empire, where plant economics is certainly better understood and its lessons more eagerly and thoroughly applied than in any other community, it is both true and surprising that no guide to the study of plant diseases and their prevention—at least none worthy of the name—has until now appeared. Nothing more admirable than the papers on vegetable pathology contributed by the Rev. Mr. Berkeley to the pages of the *Gardeners' Chronicle*, and the many writings of this and other authors scattered throughout our serial scientific literature, can, within their range and for their time, be shown elsewhere. But of recent years remarkable advances have been made, especially in Germany, in the study of the ætiology of plant diseases, and an excellent and comprehensive handbook was prepared a few years ago by Prof. Frank. Without doubt this author has gone as far as the state of science permitted him, but nevertheless a serious attempt to deal with vegetable pathology has yet to be made, and the attempt must be preceded by a great amount of laborious research. The activity shown in the investigation of parasitic diseases leaves little to be desired, but the many other ailments that the plant is subject to are but little regarded. That injuries are done by defective nutrition, by frost, and such like causes, is doubtless well recognised, but beyond this recognition there has not been very much inquiry into the matter. It is as if we were to be content with classifying the diseases of man into those due to the prevalence of east winds and the like.

While pathology is in this condition our therapeutical resources must continue scanty. Much may be hoped however from such researches in plant nutrition as those of Dr. Gilbert and Sir John Lawes. The means in our power of coping with the attacks of insects and of fungi are, it must be confessed, not very effective. There is doubtless something exhilarating in the wholesale destruction of insect pests by means of a judicious mixture of soap-suds and petroleum (applied on occasion by a fire-engine), and the heroic slaughter of the enemy may spur on the administrator to further and greater deeds, but except for very "local application" even this method will hardly lead to generally useful results. More—much more—is to be hoped from the encouragement of insectivorous birds, as recommended by entomologists. In fungal diseases our chief hope lies in "stamping out" either by means of the interception of a generation (where possible) on a comparatively worthless host, or by rigorous destruction of infected crops. It is true cases occur where timely amputation may save the remainder, and a method of cultivation (of potatoes) is under trial, the aim of which is to check the disease in each case at a certain stage of its

progress—but the result will be seen. The introduction of new and "disease-resisting" races opens up also a means of evading fungal diseases.

Mr. Worthington Smith in the introductory chapter of his book laments that "there are no special teachers of vegetable pathology in this country, and the few men who have made the subject more or less a specialty, have not the time or opportunity for extensive or continued experiment and research." As one of those who have given much time and attention to this subject, Mr. Smith has here endeavoured to make up in some measure for this want by supplying us with a treatise on the diseases of crops, selecting such as are of the first economic importance, describing their phenomena in simple language, and considering the best means of preventing attack. With the exception of the attacks of Nematodes, he has confined himself to vegetable parasites, and of these he has supplied copious illustrations faithfully recording his views of the structure and the phases passed through by such organisms. The advice given throughout is cautious and to the point; the book is in very handy form, and within the reach of all in point of price. As such, then, it must be considered a decided gain to the farmer, the gardener, and the author's fellow-workers. Many of the last-named will regard with regret the fact that the author has not seen his way to accepting the proofs of so well-established a fact as the heterœcism of the *Uredineæ*. Mr. Smith devotes a chapter to the consideration of the subject, in which he attempts to combat the irrefragable evidence of the truth of this fact furnished us by experiment. Such objections, to give but one example, as that to the different periods occupied by the cultivation-experiments of different observers are not only of no account, but Mr. Smith must surely know from his own experience that the germination and further growth of spores as well as seeds vary exceedingly in different circumstances even under the same observer's hands. But it would be beyond the scope of this review were I to enter upon any defence of the existence of heterœcism in the *Uredineæ*. What is more particularly to be noticed in this section of the book is a theory of the hereditary nature of parasitic diseases. At p. 197 the author says:—

"We have shown that plants invaded by *Puccinia* and *Æcidium* carry an hereditary disease by which they are saturated, and that the disease is capable of reaching the seeds and reappearing in the youngest seedlings. Now, if plants thus suffering from hereditary disease, and having the latent germs of disease in every part of their organisation, are experimented upon in an unnatural way, have spores of fungi placed near their organs of transpiration, whose germ-threads can pierce the epidermis or enter and choke the stomata and so reach their intercellular spaces, is it not likely that this inoculating process may start into activity the latent germs of disease?"

This is illustrated by the "instance of a person constitutionally subject to phthisis (consumption): give that person a cold and phthisis appears; but the same cold will give rise to rheumatic fever with a second constitution, and scrofula with a third, according to the tendency of the individuals to these disorders." Since Mr. Smith considers the heterœcism of the *Uredineæ* as not proven in spite of the nature and the amount of the evidence, one cannot help being profoundly astonished at the ease

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with which he, even their own author, accepts such startling speculations concerning the hereditary nature of the parasitic diseases of plants.

In the matter of the potato disease, Mr. Smith gives a history of the whole subject, and a full description of the oospores, which he claims to be those of the *Phytophthora*. At p. 340 there is a sentence of some interest in view of the above-mentioned theory.

"It is quite possible, then, that just as every atom of a mycelial thread of this fungus (potato fungus) will continue its growth to a perfect form, so every atom of a broken-up flagellum—perfectly invisible to the eyes even when the highest powers of the microscope are used—may be capable of carrying the poison and at length reproducing the perfect form of the fungus in the potato plant."

Everything is possible, but some things are undoubtedly highly improbable, and chief among these are those which we have not the slightest grounds for supposing probable. Such is the case with this speculation since (to take the flagellum only) in the first place it is not by any means certain, as the author indeed points out in the same paragraph, that a flagellum breaks up at all, and in the second it is quite unwarrantable on any known basis of fact to suppose that its fragments are endowed with any reproductive function.

Apart from such speculations, I venture to think that Mr. Smith has rendered the study of vegetable parasites a signal service in the publication of this book. Its practical uses to the farmer and the gardener are apparent, and to the student of the subject the advantage is no less, even in those cases where the author differs from the great majority of his fellow-workers, since "the case for the opposition" is as well and as strongly stated as the materials permit. The book is of practical value in this country, and it is, moreover, one which no intelligent agriculturist can afford to dispense with in these times, when farming is engaged in a struggle of such severity at so many points.

GEORGE MURRAY

### OUR BOOK SHELF

*How to Foretell the Weather with the Pocket Spectroscope.* By F. W. Cory. (London: Chatto and Windus. 1884.)

IT is of little use putting any instrument, however simple it may look, into a student's hands, if he is not previously taught how to use it. This needful information is supplied by the handy little book now before us, showing what can be done with a direct-vision spectroscope only some  $3\frac{1}{2}$  inches long.

The book commences by describing two pocket spectroscopes now in use: the "rainband spectroscope," and a newer and somewhat larger instrument, "Grace's spectroscope," which, however, is still small enough for the pocket, being only  $5\frac{1}{2}$  inches long when closed, and which has the advantage of giving a larger spectrum. Here, however, there is a most important omission, for the adaptation of a lens to focus the image of a cloud or a part of the horizon on the slit is not referred to. Instruments thus armed are far better than those of the ordinary construction for meteorological purposes, and, as made by Hilger, they are not appreciably larger. We are next told how to use the spectroscope, and a map is given (Plate 1), showing the positions of some of the lines which the student should learn to recognise in the spectrum of the sun, in order to see at once if the rainband is present or not.

On another page we find the principal rainband itself (Plate 2), which is instructive as showing the student what to look for; but in the construction of this map a larger spectroscope, of two prisms, has been employed, so that if the student in looking for the rainband uses his pocket spectroscope, he will be somewhat disappointed. It would have been more complete if a drawing of the rainband, as seen with Grace's spectroscope, could have been given side by side with Plate 2, which shows so much of the detail.

The book concludes with letters, reprinted from the *Times*, from the Astronomer-Royal for Scotland and others, showing the value of the spectroscope for meteorological purposes.

We think no one can lay down this little volume without feeling this opinion confirmed, and that in the pocket spectroscope we possess an invaluable instrument with which to forecast the state of the weather.

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*Celestial Motion: A Handy Book of Astronomy.* By W. T. Lynn. (London: Stanford, 1884.)

MR. LYNN'S long training at the Royal Observatory has eminently qualified him to write this little book. It is in no sense a school-book, but all the same it contains a most useful introduction to those parts of the science of astronomy of which it treats. These are the earth, sun, and moon; the planets arranged in three groups; comets, meteoroids, and the fixed stars. There is added a very painstaking and concise history of astronomical discovery, the only blot in which is an ineffective reference to spectrum analysis at the end.

*The First Six Books of the Elements of Euclid, and Props. i.—xxi. of Book xi., and an Appendix on the Cylinder, Sphere, Cone, &c.* With copious Annotations and numerous Exercises. By John Casey, LL.D., F.R.S. (Dublin: Hodges, Figgis, and Co., 1884.)

THIS is the second edition of a work which so accomplished a geometer as Prof. Henrici (vol. xxix. p. 453) has pronounced in these columns to be in many respects an "excellent" book. As the first edition contained 254 pages, and this one reaches 312 pages, it is manifest that the work has grown—and with its growth we find that it has acquired an accession of strength. We will indicate in what directions it has increased. First and foremost is the addition of the propositions of Euclid's Eleventh Book, which are generally read by junior students, and an appendix (well suited for candidates for the London Intermediate Examination) on the properties of the prism, pyramids, cylinder, sphere, and cone. There is also now given an explanation of the ratio of incommensurable quantities, and a still greater number, than in the first edition, of alternative proofs. Further, we can testify, by a careful perusal of the text, that the work has been "thoroughly revised as well as greatly enlarged." One feature we note, that whereas in the first edition the *syllabus* of the Association for the Improvement of Geometrical Teaching was often referred to by quotation, in this edition the name occurs but once or twice. There are reasons for most actions—we presume there are for this course of action.

We are glad to note that Dr. Casey makes frequent use of the term *right line*; the absence of the word "right" is liable to lead young boys astray: we should also prefer in one or two instances the term "circumference" (the line) to the term "circle."

Numerous easily rectified clerical mistakes occur, and we could wish that the author had uniformly written *AB* for a line drawn from *A* to *B* instead of apparently writing the letters haphazard. The terms *area* and *perimeter* are employed without definition; a work by Prof. Townsend (p. 142) is referred to without giving exact reference; and an examination question (p. 173) in-